

RESEARCH AND DEVELOPMENT
PROJECT APPROVAL REQUEST

I. Identification

The Development Branch of the Plans and Development Staff proposes a study to determine the feasibility of developing an "Automatic Focusing System". The project will be conducted [redacted] level and is programmed for Fiscal Year 1965 under Category I, "Special Techniques and Development Studies". Within this category, it is programmed under "Semi-automatic Photo Interpretation Techniques".

25X1

II. Objectives

This project would prove feasibility of an automatic focusing system for potential development. Essentially, the program would establish the feasibility of: (1) detecting image sharpness by using the autocorrelation of the image as an indicator of sharpness; (2) using a solid-state correlator as the image sharpness sensor; and, (3) developing a signal for driving the projection lens to the position of best focus. The study is intended to show that an automatic focusing system, which can be linked to present projectors by the appropriate servo loops, can be produced. The automatic focusing system will consist of the solid state correlator for obtaining the autocorrelation function of the image; an optical system for projecting two identical images on the sensor; and the required electronic circuits for converting the autocorrelation signals into a form for controlling a servo motor to, in turn, drive the projection lens to the position of best focus. Moreover, the study would determine sensitivity of the autocorrelation function to focus and, in particular, the sensitivity of the [redacted]-developed correlation sensor. [redacted] effort should yield designs for a compact, economical system for achieving and maintaining focus on various projection and direct-viewing devices.

25X25X1

III. Background

Correlation systems now in use generally require a scanning system, an electronic multiplier, and an electronic integrator -- together with the associated power supplies, deflection circuits, focusing circuitry, amplifiers, etc.

Such equipment is too costly, and complex for automatic focusing with typical reconnaissance viewers. Other systems in use, such as

CONFIDENTIAL

mechanical linkage devices, require periodic calibration, and these systems are designed to be used with specific lens systems. It would be extremely beneficial to develop a system that would not require periodic calibration and could be applied to a variety of lens systems.

[] has submitted an unsolicited proposal to develop such an automatic focusing system. Because the corporation has applied for patents for their system, they must be considered a sole source supplier. [], is considered to have the technical capability to develop the system outlined in the technical specifications.

25X1

25X1

IV. Technical Specifications

Basically, a correlator can be used to sense image sharpness because the cross-correlation of two images, both in sharp focus, is substantially higher than the cross correlation of two defocused images. Plotting light intensity vs position, it can be shown that a focused image will have a higher value on the intensity scale at a given point than the defocused image. This is because the total energy under the curve must be conserved. In the defocused case, the light is spread over a wider position so the intensity must be lower. The correlation function is obtained by multiplying the intensities of the image, point by point and adding the contributions from all the image points. It is clear that the peak of the correlation curve is lower for the defocused image.

The use of the correlation technique is not new but its application to automatic focusing has been limited because of the cost, size, weight and power required by the implementation. With the use of the solid state correlator developed by [], it should be possible to implement an automatic focusing system that would overcome the problems cited above.

25X1

V. Contract and Financial Arrangements

The work is to be performed under [] cost-type contract [] for the demonstration of feasibility, design and construction of a breadboard solid-state automatic focusing system. Delivery of the final report is scheduled for three months after the date of award of contract. (This contract is recommended on a sole source basis because of the proprietary sensor proposed for use in the development of the system.)

25X1

25X1

VI. Security

[]

25X1

CONFIDENTIAL